



# Weekly Work Report

Wenjie Niu

VISION@OUC

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This week, I start the Deep Learning course. Although I watched the course and took some notes before, the real and deep understanding is not enough for me. Therefore, it's necessary to learn again. In this week, I'm learning the introduction of deep learning, the main content is here as following.

# 1 Content

## 1.1 Courses in This Specialization

- Neural Networks and Deep Learning
- Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization.
- Structure your Machine Learning project
- Convolutional Neural Networks
- Natural Language Processing: Building sequence models

## 1.2 Neural Network

It's a powerful learning algorithm inspired by how the brain works. Here are 2 examples to show what is a Neural Networks.

- Example 1: Single Neural Networks.

Given data about the size of houses in real estate market, and you need to fit a function that will predict their price. The curve of the price is similar to Rectified Linear Unit(ReLU) function in Fig. 1. While the difference is that the real curve can never be negative and it starts at zero.

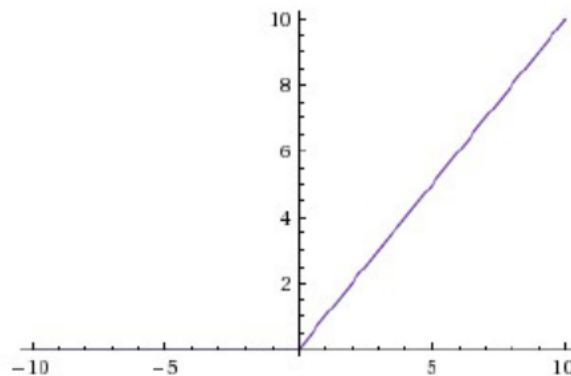


Figure 1: Rectified Linear Unit(ReLU) function

- Example 2: Multiple Neural Networks

The price of houses can be affected by other features such as size, numbers of bedrooms, zip code and wealth. The role of the neural network is to predict the price and it will automatically generate the hidden units. We only need to give the input  $x$  and the output  $y$  as shown in Fig. 2.

## 1.3 Supervised Learning for Neural Network

In supervised learning, we are given a data set and already know what our correct output should look like, having the idea that there is a relationship between the input and the output as shown in Table 1.

Supervised learning is categorized into “regression” and “classification” problems. In a regression problem, we are trying to map input variables to some continuous function, predicting the results within

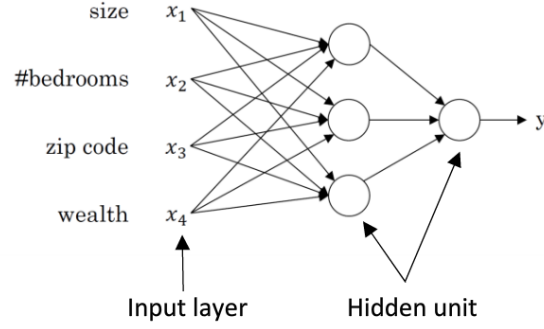
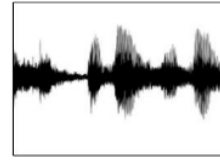


Figure 2: Multiple Neural Network [1]

Size	#bedrooms	...	Price (1000\$s)
2104	3		400
1600	3		330
2400	3		369
⋮	⋮		⋮
3000	4		540



Audio



Image

User Age	Ad Id	...	Click
41	93242		1
80	93287		0
18	87312		1
⋮	⋮		⋮
27	71244		1

Four scores and seven  
years ago...

Text

Figure 3: Structured data [1]

Figure 4: Unstructured data [1]

the a continuous output. In a classification problem, we are trying to map input variables into discrete categories.

Table 1: Here are some examples of supervised learning

Input(x)	Output(y)	Application
Home features	Price	Real estate
Ad, user info	Click on ad?(0/1)	Online advertising
Image	Object	Photo tagging
Audio	Text transcript	Speech recognition
English	Chinese	Language translation
Image, Radar info	Other cars position	Autonomous driving

There are different types of neural network, for example Convolution Neural Network(CNN) used often for image application and Recurrent Neural Network used for one-dimensional sequence data.

Another significant concept is about structured in Fig. 3 and unstructured data in Fig. 4. Structured data refer to things that has a defined meaning such as price, age while unstructured data refers to thing like pixel, raw audio, text.

## 1.4 Why Is Deep Learning Taking off?

Deep learning is taking off due to a large amount of *data* available through the digitization of society, faster *computation* and innovation in the development of neural network *algorithm*.

When there are a small training set, the performance depends much on skill at hand engineer features.

But it doesn't work when a huge training set. Two things have to be considered to get the high level of performance:

- Being able to training enough neural network
- Huge amount of labeled data

In a word, scale drives deep learning progress.

## 2 Progress in this week

This week I learnt the introduction of deep learning including some new concepts such as neural network, supervised learning, and the reason of deep learning's prosperity. The following are the steps you took:

**Step 1** Watched the courses clips.

**Step 2** Watched again and took notes.

**Step 3** Grasped the related pictures and wrote the Latex.

**Step 4** Organized the content and push to the github.

## 3 Plan

**Objective:** Learn Neural Network and Deep Learning by myself.

2018.07.08—2018.05.14 Watch week two course clips and take the note.

2018.07.15—2018.07.21 Do so on week three course.

2018.05.22—2018.05.38 Do so on week four course.

## References

- [1] A. Ng. Neural network and deep learning. <https://www.coursera.org/learn/neural-networks-deep-learning/exam/QR8kq/introduction-to-deep-learning>.